172-3

ME 4934

Lenkurt

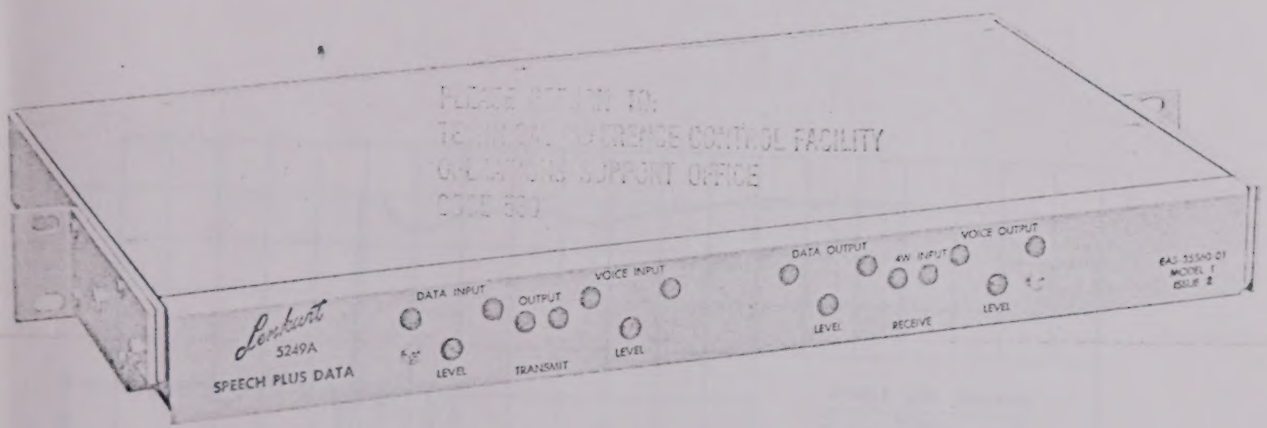
5249A

MP-34940

MP MASTER

MA36228

SPEECH PLUS DATA PANEL



TYPICAL APPLICATIONS — In a typical application, the panel connects a Lenkurt 25A 200-bit-per-second data channel, along with a speech circuit, to one Lenkurt 46A voice channel.

Two or more voice frequency channels may be operated in tandem by fitting each with speech plus data panels. The panels provide the filtering and level coordination required to interconnect the speech portions on either a two-wire or four-wire basis and allow the data to be operated over each section independently. Alternatively, the HP and LP filter combination permits the data portions to be connected in tandem and the speech paths to be operated independently. The number of data channels that can be accommodated varies with the channel bandwidth of the carrier equipment or cable, bandwidth desired for the speech, and the data channel spacing. Channel availability is indicated on the typical filter curves shown in Figures 1 through 4.

STRAPPING OPTIONS—The panel provides:

1. Limiter strapping to coordinate with 0 dbm, -13 dbm, and -16 dbm test tones.
2. Two-wire drop to 4-wire hybrid termination, and 300-, 600- or 900-ohm impedance for the 2-wire drop.

SMALL SIZE — The Speech Plus Data Panel requires only 1¾ inches of vertical space on a standard 19-inch equipment rack.

NO POWER REQUIREMENT—Passive elements are used throughout the panel, including the speech limiting circuitry; thus, no power is necessary.

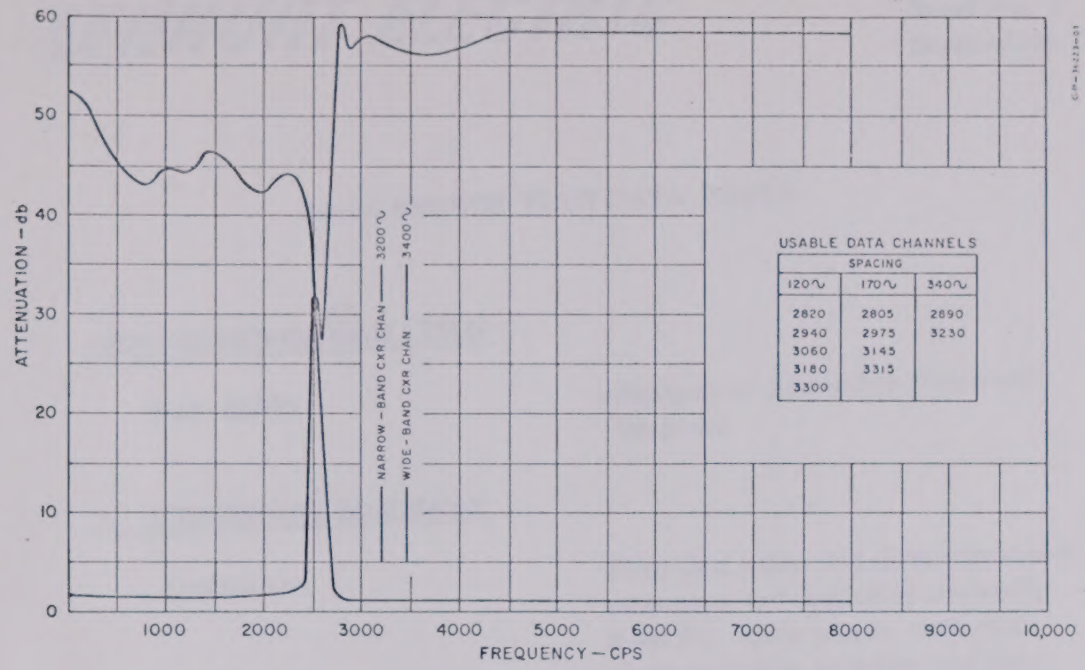


Figure 1. Typical frequency response curves of Speech Plus Data Panel with Code B (2.4 kc-LP – 2.75-kc HP) highpass-lowpass filter.

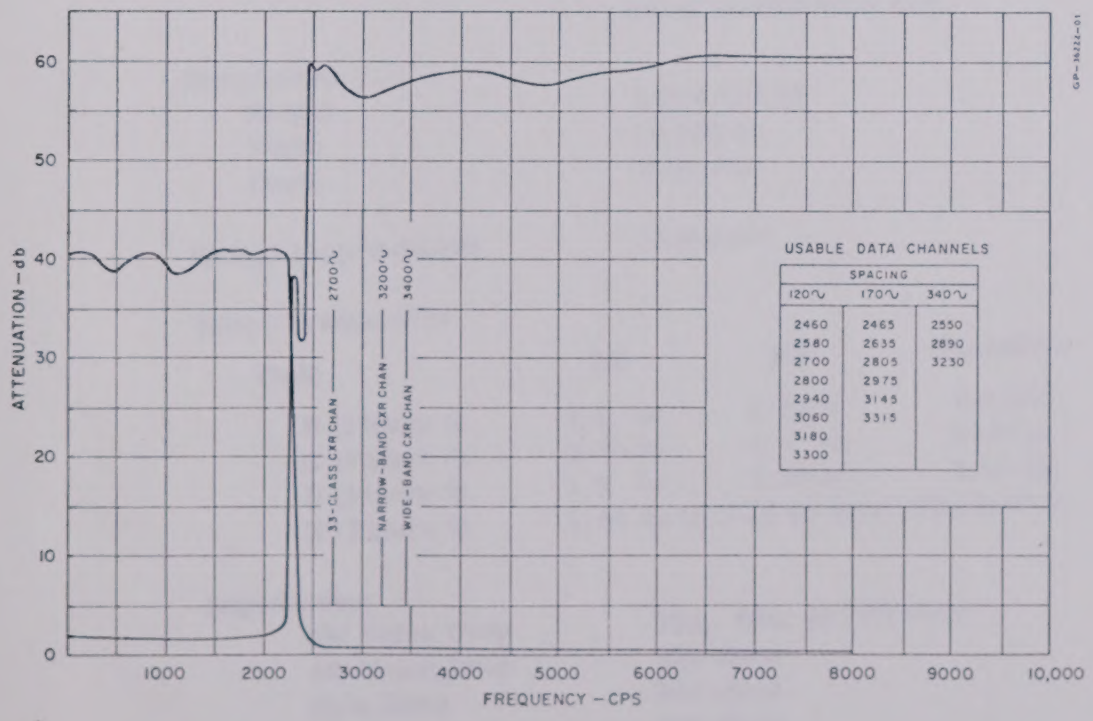


Figure 2. Typical frequency response curves of Speech Plus Data Panel with Code C (2.08-kc LP – 2.4-kc HP) highpass-lowpass filter.

LENKURT ELECTRIC

Form 5249A-S
EO-35560
Issue No. 2
September, 1963

5249A SPEECH PLUS DATA PANEL

ASSOCIATED INFORMATION

EAS-35560	-Equipment Assembly Schematic Diagram

1. TECHNICAL SUMMARY

Application	Provides voice and data transmission over v-f facilities normally used for voice alone, with complete isolation of voice and data. Initially used with 23A systems.
Installation	Mounts on standard 19-inch equipment rack with all external connections made to panel terminal strip located behind front panel cover on left-hand side.
Dimensions:	
Height	1-3/4 inches
Width	19 inches
Depth	10 inches
Weight (Approximate)	11 pounds

Filter Frequencies

Code	LP	HP	Crossover
B (Figure 4)	2.4 kc	2.75 kc	2.62 kc
C (Figure 3)	2.08 kc	2.4 kc	2.28 kc
D (Figure 2)	1.7 kc	2.04 kc	1.94 kc
E (Figure 5)	1.65 kc to 2.26 kc Band-Elimination		

Impedances:	
2W Voice Drop	300, 600, or 900 ohms
4W Voice Drop	600 ohms
Data Drop	600 ohms
Line	600 ohms
Levels	Refer to Tables A and B.

Test Points:	
Data Input	Used for measurement of Data transmit level
Voice Input	Used for measurement of Voice transmit level
Output	Used for measurement of Data or Voice transmit level on line side of filters
Data Output	Used for measurement of Data receive level
Voice Output	Used for measurement of Voice receive level
Input	Used for measurement of combined Data and Voice receive level on line side of filters
Controls and Adjustments:	
Data Input Level	Continuously variable 0-23 db "T" pad adjusts Data transmit level
Voice Input Level	Continuously variable 0-23 db "T" pad adjusts Voice transmit level
Data Output Level	Continuously variable 0-23 db "T" pad adjusts Data receive level
Voice Output Level	Continuously variable 0-23 db "T" pad adjusts Voice receive level
VOICE - DATA Isolation	50 db or greater
Environmental Conditions:	
Ambient Temperature Range	0° - 65° C (32° - 149° F)
Maximum Relative Humidity	90%

2. ELECTRICAL DESCRIPTION

2.01 The speech plus data panel is a passive unit, requiring no external power, which provides for frequency division multiplexing of data

and speech over a single carrier channel normally used for speech alone. A highpass-lowpass filter or coupling pad-band-elimination filter combination provides the required separation. The data uses the high-pass or pad section and the speech uses the low-pass or band-elimination section of the filter. The panel provides signal level control, volume limiting in the speech section, 2W-4W operation, and three different drop-matching impedances of the voice channel.

2.02 Transmit data signals from the drop enter the unit and pass through a strappable 16-db pad and a variable "T" pad to the high-pass filter or coupling pad. Transmit voice signals from the drop enter the unit through a balancing transformer and variable "T" pad to a limiter, which limits speech peaks to prevent interference in the data portion of the signal. Output of the limiter connects either to the low-pass or band elimination section of the filter. The combined output of the filter sections then connects to the line equipment through a balancing transformer.

2.03 When installed on a 2-wire drop to 2-wire line basis, only this section of the panel is used and the receive data and voice signals follow the reverse path of the transmit signals.

2.04 When installed on a 4-wire drop to 4-wire line basis, only the transmit signals follow the above path. The combined data and voice receive signals enter the receive side unit through a balancing transformer to the HP-LP or Pad-BE filter. Data signals from the high-pass or pad section of the filter pass through a level adjusting potentiometer, and 16-db pad for connection to the data drop equipment. Voice signals from the low-pass or band-elimination section of the filter pass through a level adjusting potentiometer to an impedance matching transformer for connection to the 4-wire drop.

2.05 For applications requiring 2-wire v-f drop to 4-wire line operation, a resistive type hybrid consisting of R4, R5, R6, and C3 may be strapped into the circuit. A combination of the resistive hybrid and impedance matching transformer provide for 2-wire v-f drop operation at 300, 600, or 900 ohms with the data drop remaining at 4-wire, 600 ohm operation. The resistive hybrid provides a fixed loss of 12 db in the transmit direction and 3 db in the receive direction.

3. LINEUP

3.01 The lineup of the speech plus data panel may be accomplished by applying a test tone to adjust the v-f path, and any one of the data signals to adjust the data path. Figure 1 is a simplified block diagram of the speech plus data panel.

A. Transmit

3.02 Using a Hewlett-Packard 200CD Oscillator (or equivalent), apply a test tone at the proper level on the v-f drop equipment.

3.03 Connect a Hewlett-Packard 400D-DB VTVM (or equivalent) to the OUTPUT test jacks (bridging) on the speech plus data panel. While observing the meter, adjust the VOICE LEVEL INPUT control for the level required by the connecting line facilities (-16, -13, -4, or 0 dbm).

Note: The speech plus data panel should be connected to its normal transmission facilities or artificially terminated with 600 ohms on the line side.

3.04 When the v-f level has been adjusted, remove the oscillator and terminate the drop.

3.05 If more than one data channel is used, turn off all data channels except channel 1. Key channel 1 to the marking condition.

3.06 While observing the meter, adjust the DATA INPUT LEVEL control to the level required by the total number of data channels in service as stated in Table A.

TABLE A

Output V-F Level (DBM)	Corresponding Data Level (Per Channel - DBM)	
	1-4 CH. IN SVC.	5-8 CH. IN SVC.
-16	-38	-43
-13	-35	-40
0 or -4	-22	-27

3.07 When the data level has been adjusted, turn on each data channel separately (one at a time) and verify that each data channel is within ±1.0 db of channel 1. If these requirements are not met, adjust the out of tolerance data channel per data equipment lineup instructions.

3.08 When all channels meet requirements, restore the data channels to the normal operating condition, remove the termination from the v-f drop, and remove the VTVM from the OUTPUT test jacks.

3.09 Test points VOICE INPUT and DATA INPUT may now be measured with the panel in service, and the level recorded for future in-service measurements.

B. Receive

3.10 At the distant, or transmit, terminal, apply a test tone of the required level to the transmission line facilities.

3.11 At the local, or receive, terminal, connect the VTVM to the INPUT test jack (bridging) and adjust the transmission facilities to the required level.

Note: The transmission facilities are to be adjusted to the level normally required by the v-f channel alone. The data and v-f drops should be terminated in their characteristic impedances.

3.12 Transfer the VTVM to the VOICE OUTPUT test jacks and while observing the meter, adjust the VOICE OUTPUT LEVEL control to the level required by the connecting drop equipment.

3.13 Transfer the VTVM to the DATA OUTPUT test jacks.

3.14 At the transmit terminal, turn off all channels except channel 1 and key channel 1 to the marking condition.

3.15 At the receive terminal, adjust the DATA OUTPUT LEVEL control to the level required by the data equipment.

3.16 The insertion loss of the voice and data receive paths are stated in Table B.

TABLE B

FILTER CODE	INSERTION LOSS (DB)			
	VOICE CHANNEL		DATA CHANNEL	
	MAX.	MIN.	MAX.	MIN.
B, C, D	24.5	1.5	40	1
E	28	5	52	13

3.17 When all tests have been completed, remove the test equipment and restore all channels to the normal operating condition.

4. OPTION CODING

4.01 Option codes indicate various optional arrangements of equipment to meet specific requirements. Available arrangements are listed below by code and must be specified in equipment orders.

5249A — Provides basic equipment for 2-wire v-f drop to 2-wire line or one-way applications.

Code A — Provides an additional receive assembly for either 4-wire or 2-wire v-f drop to 4-wire line applications.

The type and frequency of the filter must be indicated by an additional code for each section of the panel as indicated below.

Code B — 2.75 kc HP and 2.4 kc LP

Code C — 2.4 kc HP and 2.08 kc LP

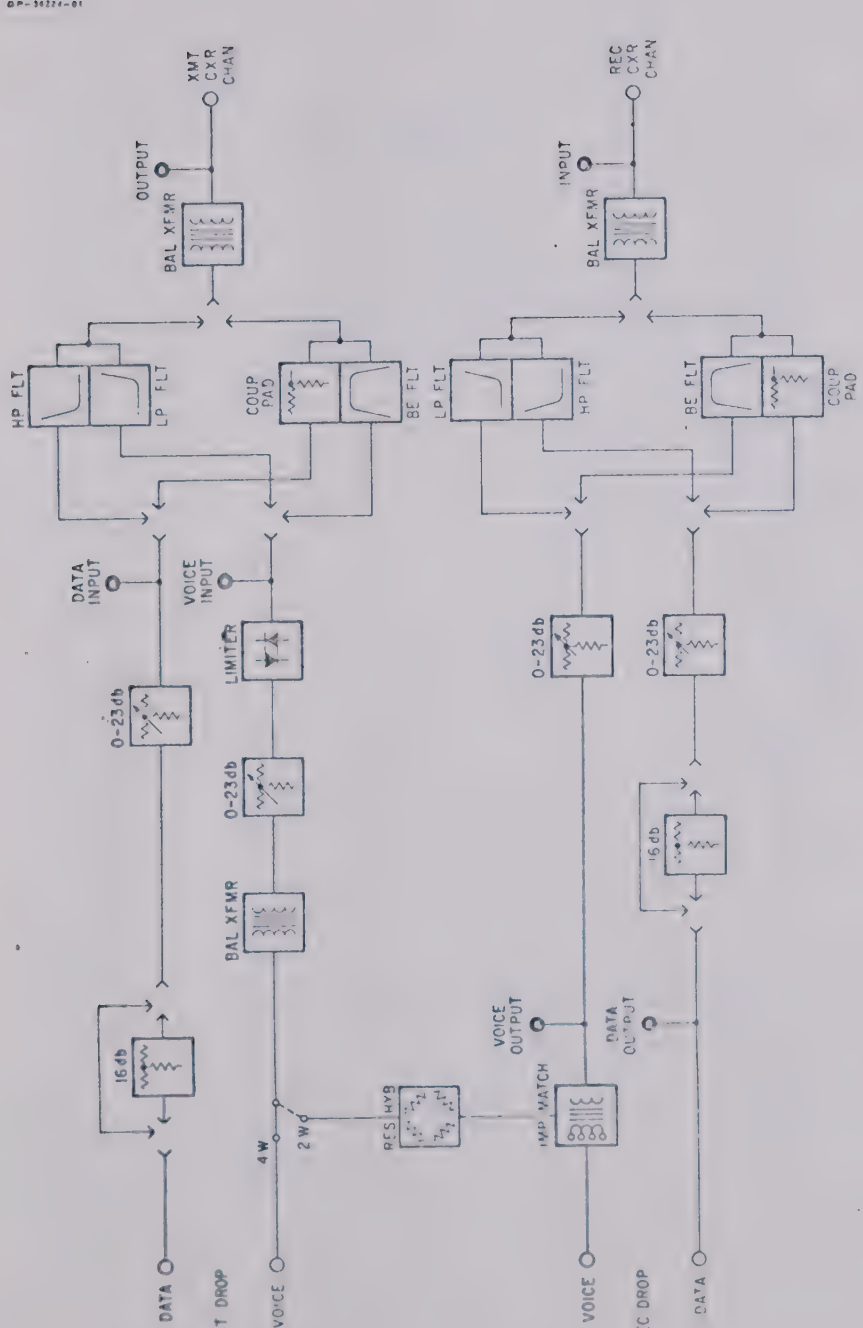
Code D — 2.04 kc HP and 1.7 kc LP

Code E — 1.65 kc to 2.26 kc BE with a coupling pad

EXAMPLE: 5249A-C indicates a panel for 2-wire v-f drop to 2-wire line application with a 2.4 kc HP and 2.08 kc LP filter combination.

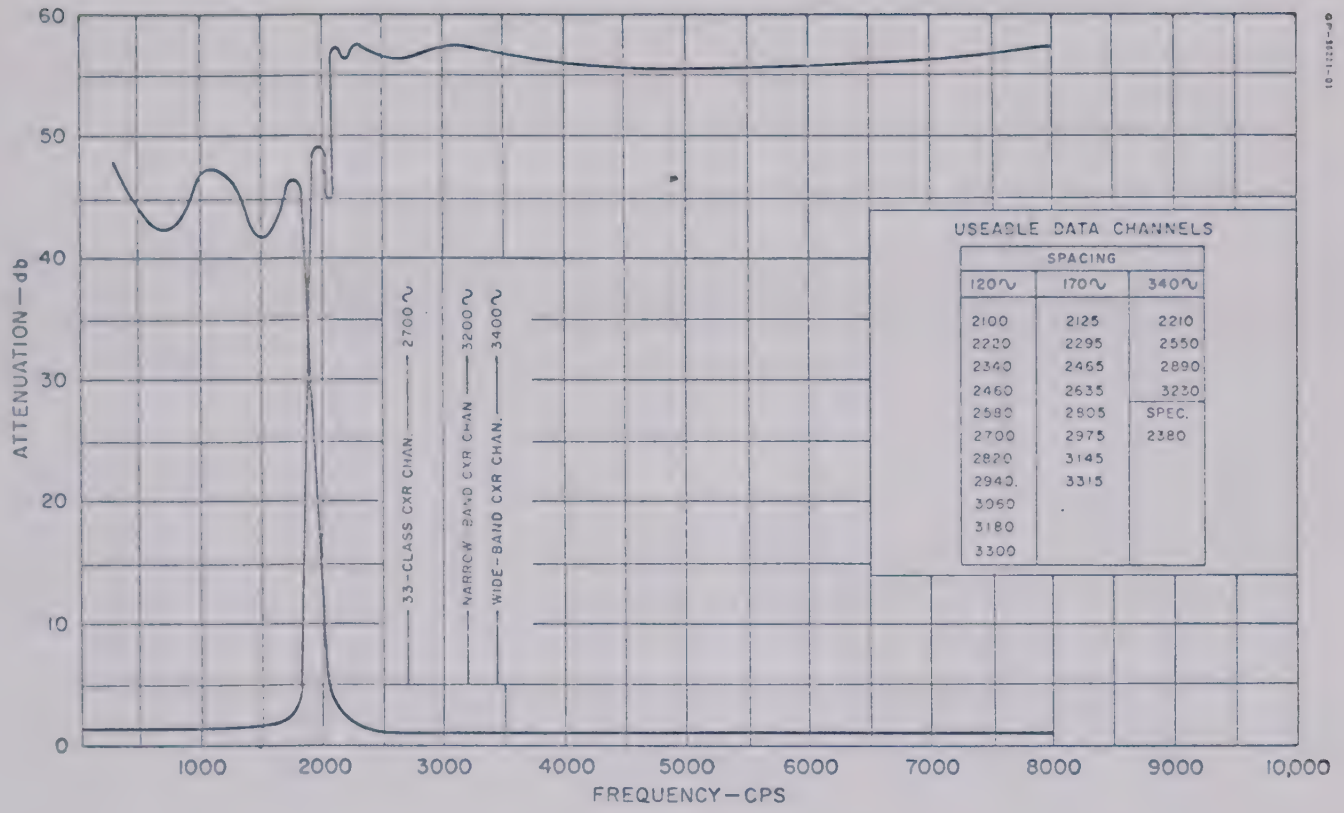
EXAMPLE: 5249A-E-AE indicates a panel for 2-wire or 4-wire v-f drop to 4-wire line application with a 1.65 kc to 2.26 kc BE filter and coupling pad combination in the basic section and in the Code A section.

Reason for reissue: Issue No. 2 - Added Code E and OPTION CODE information.



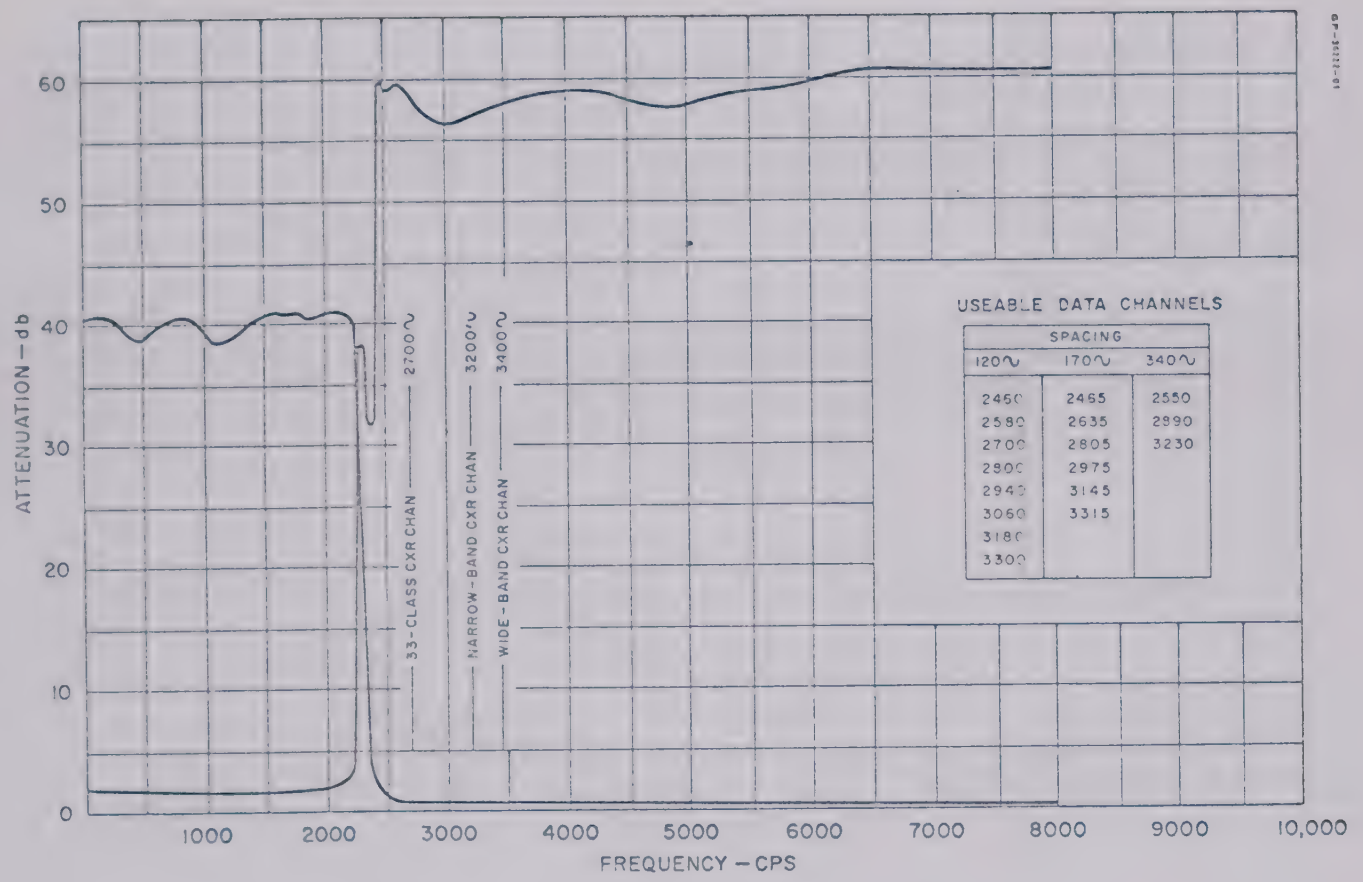
SIMPLIFIED BLOCK DIAGRAM — SPEECH PLUS DATA PANEL

FIGURE 1



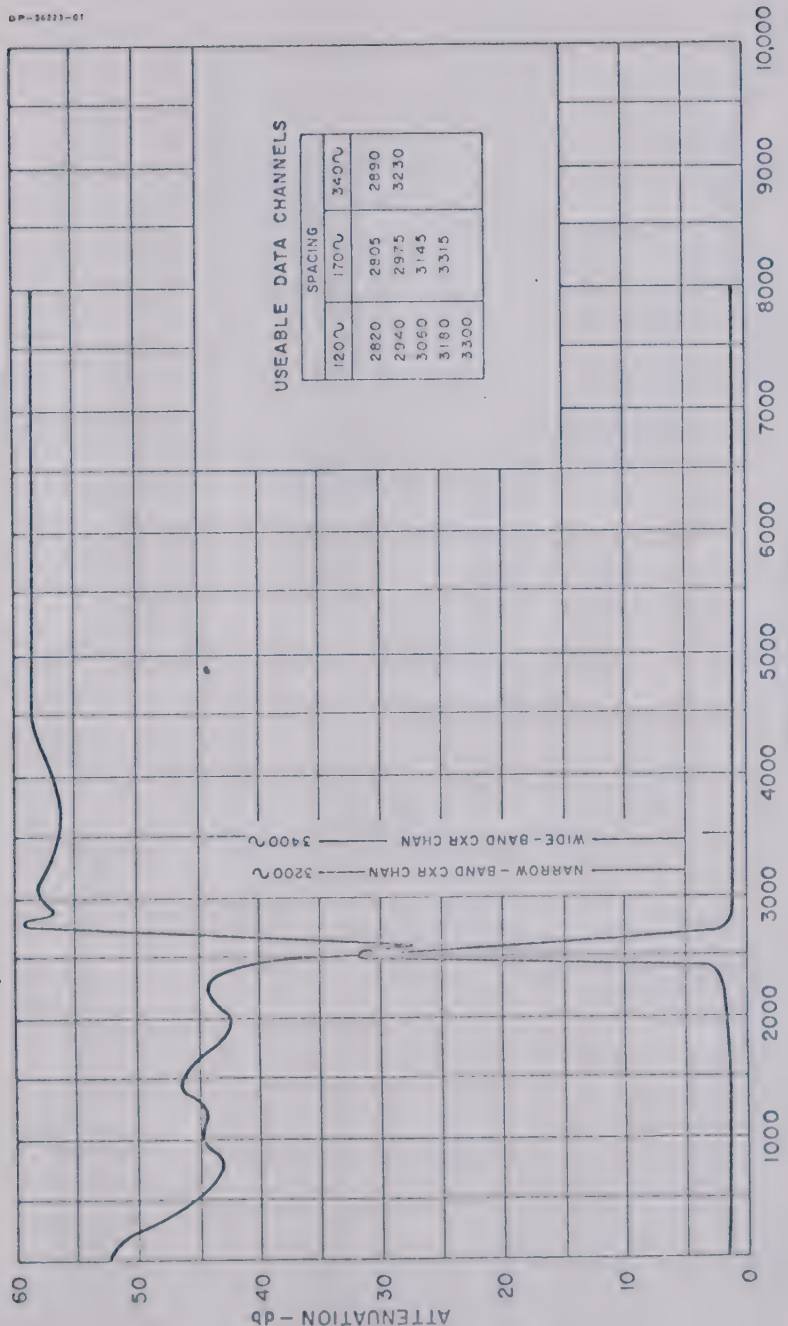
TYPICAL RESPONSE CURVES OF SPEECH PLUS DATA PANEL
WITH CODE D (1.7KC LP—2.04KC HP) HP-LP FILTER

FIGURE 2



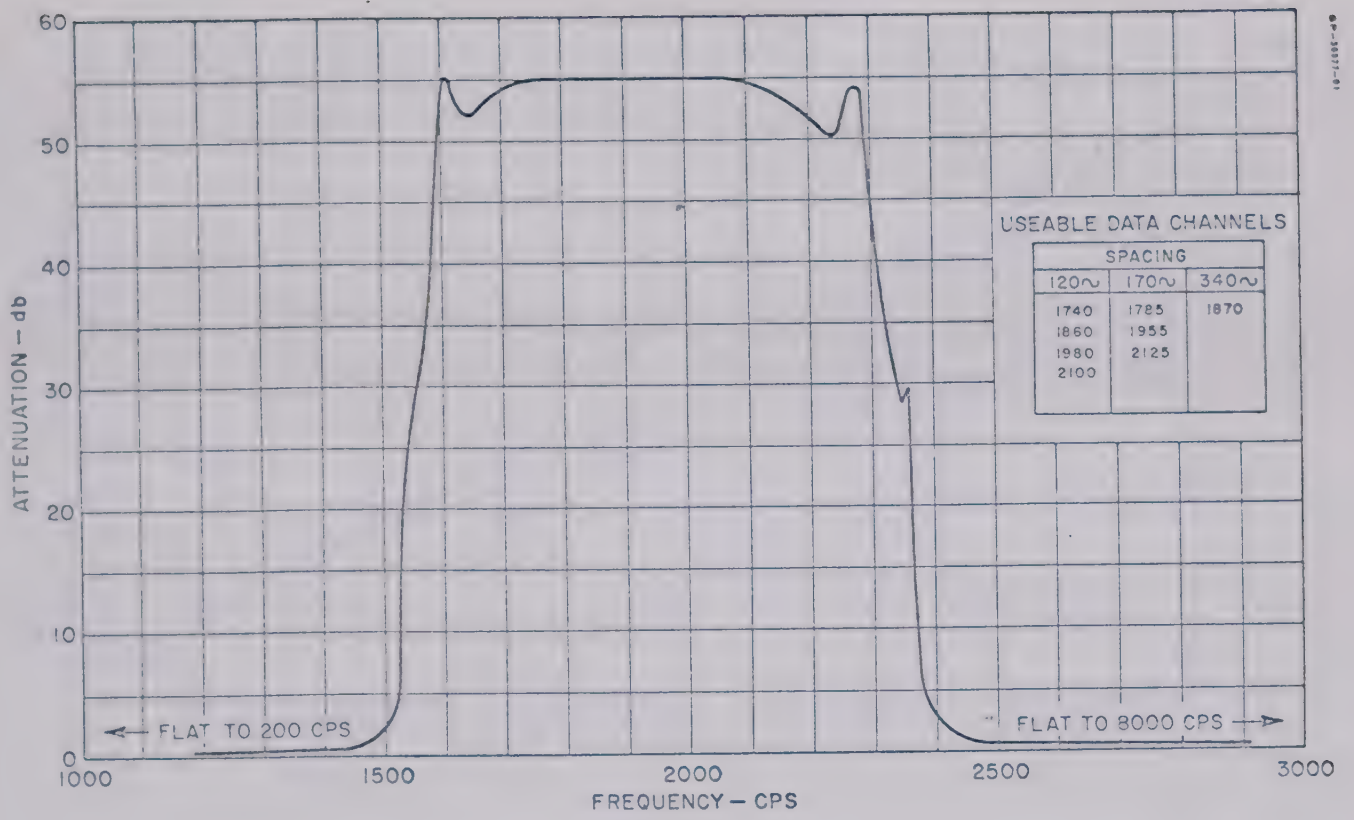
TYPICAL RESPONSE CURVE OF SPEECH PLUS DATA PANEL
WITH CODE C (2.08KC LP–2.4KC HP) HP-LP FILTER

FIGURE 3



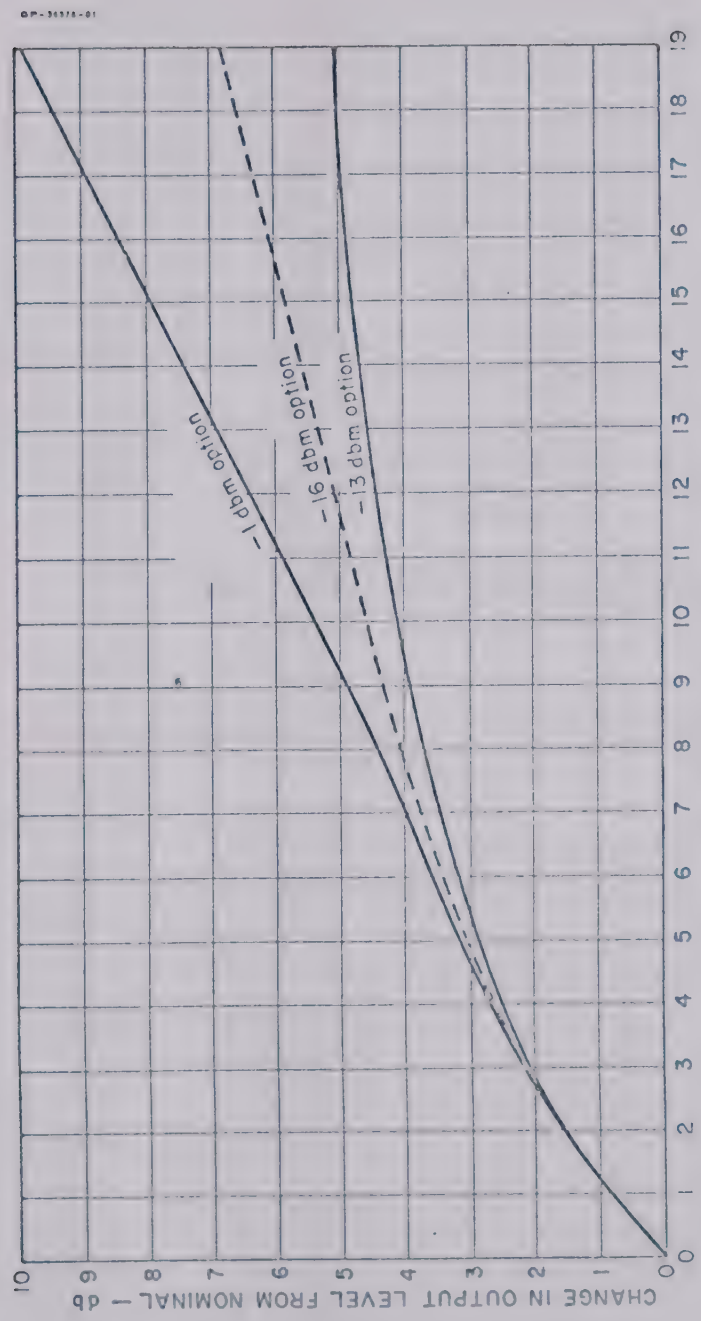
TYPICAL FREQUENCY RESPONSE OF SPEECH PLUS DATA PANEL
WITH CODE B (2.4KC LP—2.75KC HP) HP-LP FILTER

FIGURE 4



TYPICAL FREQUENCY RESPONSE OF SPEECH PLUS DATA PANEL
WITH CODE E (1650 to 2260 cps) PAD-BE FILTER

FIGURE 5



EFFECT OF LIMITER ON V-F LEVELS, INPUT VERSUS OUTPUT

FIGURE 6

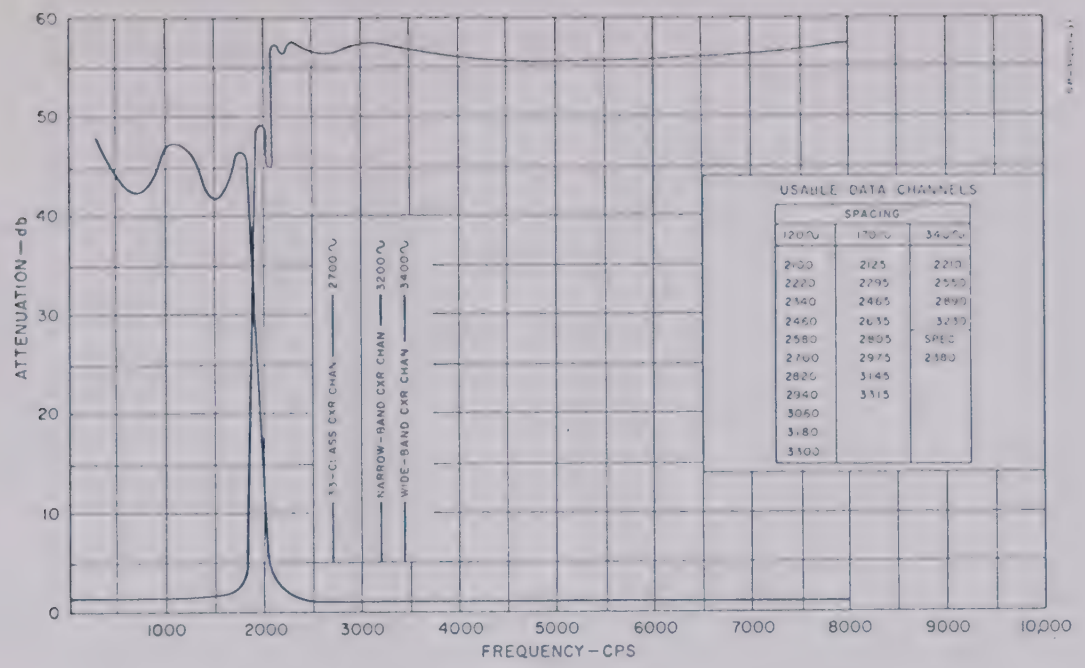


Figure 3. Typical frequency response curves of Speech Plus Data Panel with Code D (1.7-kc LP — 2.04-kc HP) highpass-lowpass filter.

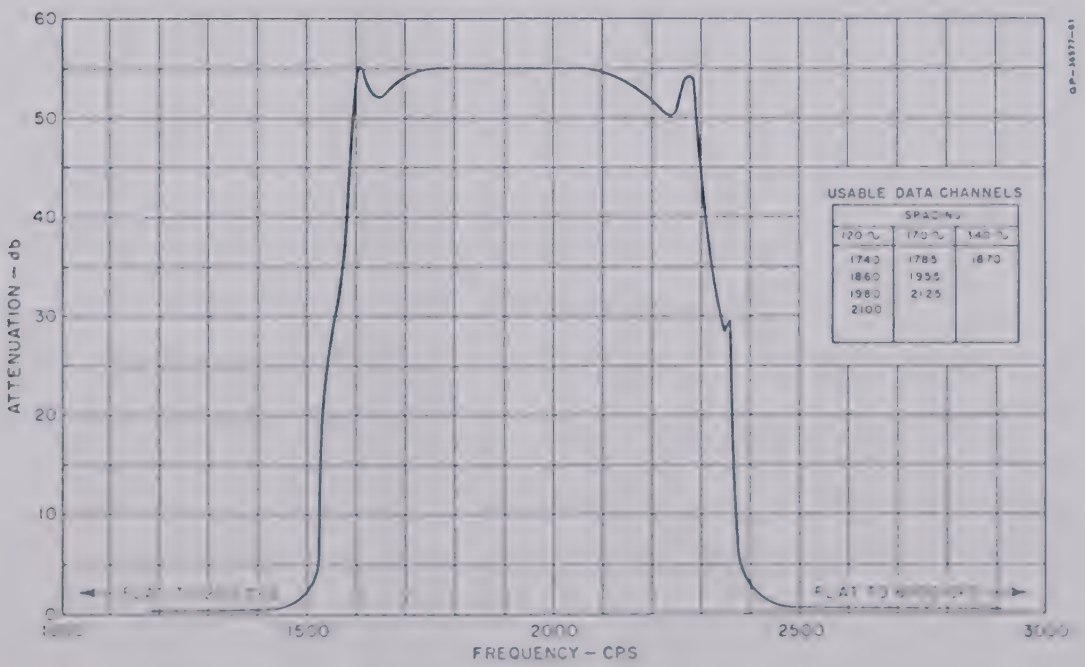


Figure 4. Typical frequency response curves of Speech Plus Data Panel with Code E (1650 to 2260 cps) pad/band-elimination filter.

FIG. 1 [1] [2] [3]

SPEECH PLUS DATA (TRANSMIT)

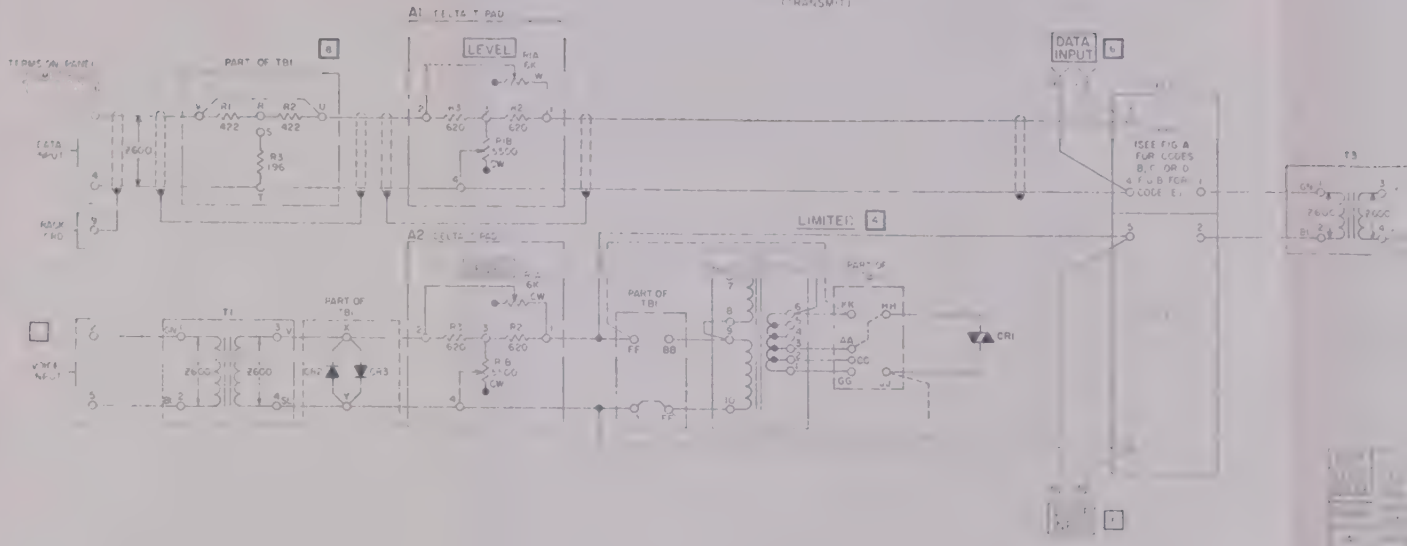


FIG. 2 [1] [5]

(CODE A) (RECEIVE)

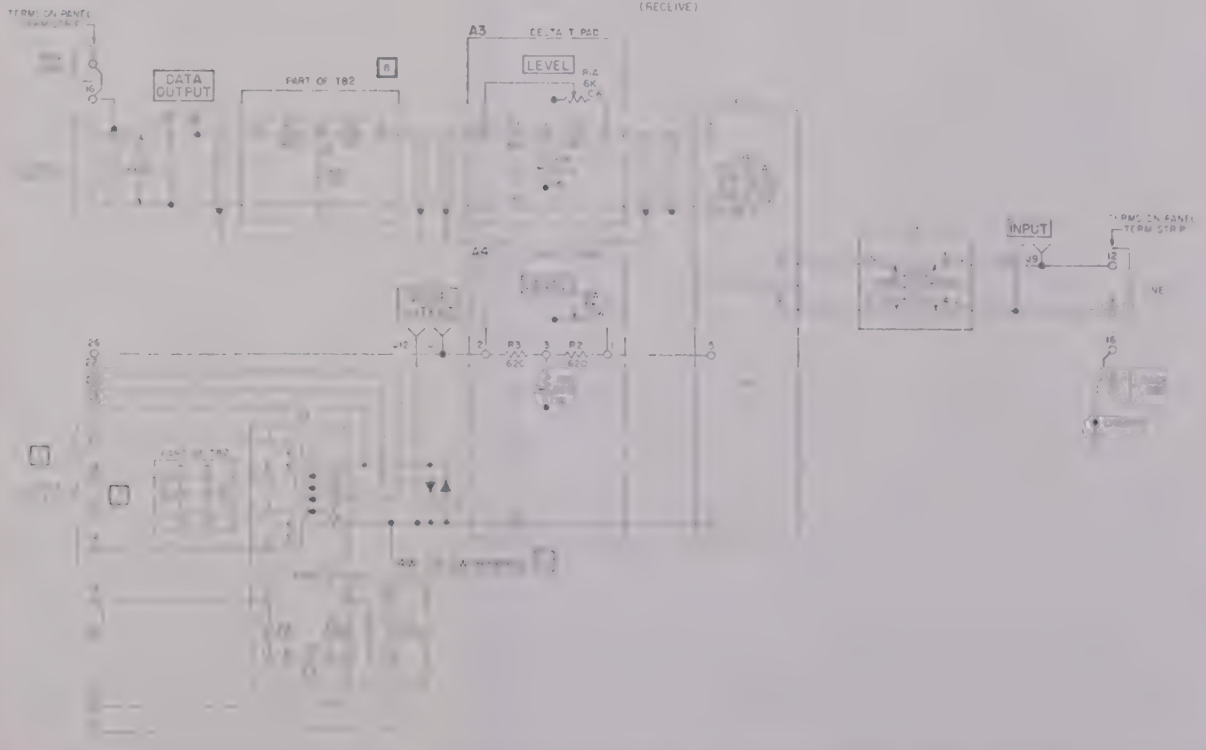


FIG. A

FILTER
(CODES B, C, OR D)

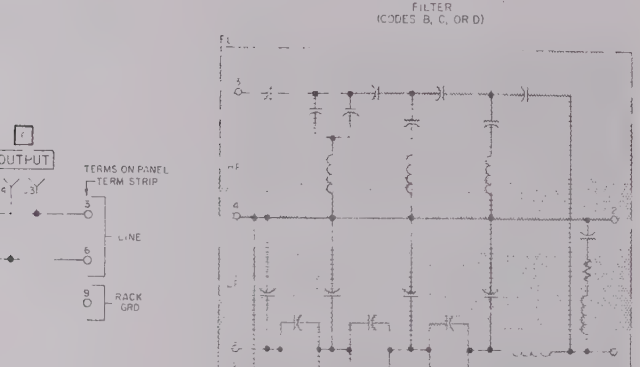


TABLE A [1]

FUNCTION	FIG
WIRE DROP TO 2-WIRE LINE SIMPLEX OPERATION FOR VOICE LSO PROVIDES AMPLITUDE LIMITING FOR SPEECH, LEVEL FOR SPEECH AND DATA, AND MOUNTING FACILITIES FOR MITING FILTERS.	1
VEL CONTROLS FOR SPEECH AND DATA, IMPEDANCE MATCH CIVE DROP, A HYBRID FOR 4-WIRE TO 2-WIRE OR 4-WIRE TO ATION AND MOUNTING FACILITIES FOR SPECIFIED HIGH SS AND BAND ELIMINATION FILTER COMBINATIONS.	2
LTER WITH 2.75KC HP AND 2.4KC LP.	A
LTER WITH 2.4KC HP AND 2.08KC LP.	A
TER WITH 2.04KC HP AND 1.7KC LP.	A
50 TO 2260 CYCLE BAND ELIMINATION FILTER PLUS A DATA ERID.	B

TABLE B [4]

LIMITER STRAPPING TBI		
"OUTPUT" NOMINAL LEVEL	CODE	STRAP
-1 DBM	B, C OR D	DD-EE, FF-KK, JJ-KK, HH-BB
-13 DBM		DD-CC, FF-KK, JJ-BB, HH-GG
-16 DBM		DD-EE, FF-KK, JJ-EE, HH-AA
-1 DBM	E	DD-AA, FF-BB, JJ-EE, HH-BB
-13 DBM		DD-AA, FF-EE, JJ-EE, HH-CC
-16 DBM		DD-GG, FF-KK, JJ-EE, HH-AA

TABLE C [5]

CODE A EQUIPPED

E DROP	IMPEDANCE		STRAP
	TRANSMIT	RECEIVE	
	600 OHM	300 OHM	24-26
	600 OHM	600 OHM	23-26
	600 OHM	900 OHM	22-26
E DROP	300 OHM		2-7, 5-8, 26-27 AND 20-24
	600 OHM		2-7, 5-8, 26-27 AND 20-23
	900 OHM		2-7, 5-8, 26-27 AND 20-22

TABLE D [8]

FIXED PAD STRAPPING	
NOMINAL LOSS	STRAP TERMINALS
0 DB	V TO U
16 DB	R TO S

NOTES:

1. EQUIPMENT
EQUIPMENT FURNISHED IN ACCORDANCE WITH TABLE A

2. RESISTORS
ALL RESISTANCE VALUES SHOWN IN OHMS. K DENOTES THOUSAND.

3. CAPACITORS
ALL CAPACITORS SHOWN IN MICROFARADS UNLESS OTHERWISE NOTED.

4. LIMITER STRAPPING
TABLE B PROVIDES OPTIONAL STRAPPING OF LIMITER. LIMITER WILL BE STRAPPED, AS SHOWN, FOR -15 DBM INPUT AND -16 DBM OUTPUT OPERATION UNLESS OTHERWISE SPECIFIED.

5. 2 WIRE OR 4 WIRE DROP OPERATION
WHEN CODE A EQUIPPED, REFER TO TABLE C FOR OPTIONAL STRAPPING TO PROVIDE EITHER 2 WIRE OR 4-WIRE VOICE OPERATION. STRAPPING WILL BE PROVIDED AS SHOWN FOR 4-WIRE DROP 600,600 OHM UNLESS OTHERWISE SPECIFIED.

6. 2 WIRE TO 2 WIRE OPERATION
WHEN THE BASIC PANEL (FIG 1) IS USED FOR 2 WIRE TO 2 WIRE OPERATION, MEASUREMENTS OF BOTH INPUT AND OUTPUT LEVELS WILL BE MADE AT THE DATA INPUT, VOICE INPUT AND OUTPUT (LINE) TEST POINTS. THE 2 WIRE VOICE TERMINATION WILL BE MADE ON TERMINALS 2 AND 5 OF THE PANEL TERMINAL STRIP.

7. ISOLATION CAPACITORS
WHEN ISOLATION IS NOT DESIRED, SHORT CAPACITORS BY STRAPPING TERMINALS 18 TO 21 OF PANEL TERMINAL STRIP. THIS STRAP WILL NOT BE PROVIDED UNLESS OTHERWISE SPECIFIED.

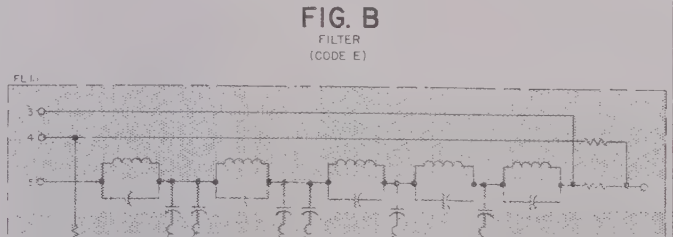
8. FIXED PAD STRAPPING
TABLE D PROVIDES OPTIONAL STRAPPING OF FIXED PADS. PADS WILL BE STRAPPED, AS SHOWN, FOR 0 DB LOSS UNLESS OTHERWISE SPECIFIED.

9. ORDERING CODE
WHEN ORDERING SPECIFIED FILTER FREQUENCY, ORDER PER THE FOLLOWING EXAMPLE:

5249A-C	A-C
FILTER FOR BASIC	FILTER FOR CODE A

FIG. B

FILTER
(CODE E)



EAS-35560-M1

	L-M9	SHEET 1 OF 2	
1	ORIGINAL	RM	
	ECA 19841 IN FIG 1 & 2 SHIELDED CABLE AND GROUNDS ADDED TO DATA INPUT, OUTPUT PLT AND LINE SIDE OF FILTERS, RESISTORS R1, R2 & R3 ADDED. LINE BALANCING TRANSFORMER, T1, ADDED. NOTE 6, [illegible] STRAPPING [illegible]	11-20-62	
2	ECA 17748 REARRANGED TO PROVIDE FOR CODE E. REFER TO EAS-35560, ISSUE 3 FOR PRIOR EQUIPMENT.	9-3-63 DAH	
3 CLASS D	ECA 20242 IN FIGURE 2, LIMITER SECTION REDRAWN. NOTES 4 & 5 REVISED.	4-24-63 RED	
4	ECA 26618, CLASS D IN TABLE OF REPLACEABLE PARTS, STOCK NO. FOR CR1 WAS 174-38547-01 & JACKS J1, J6, J7 & J12 WERE SHOWN AS 139-28969-02 & J2, J5 & J8 WERE SHOWN AS 139-28969-01. ALL PREVIOUSLY SHOWN IN ERROR. IN FIG. 101 [illegible] REF ADDED.	11-14-66 JJ	
5	ECA 30301, CLASS B IN FIG. 1, 101 & TABLE E [illegible] REF ADDED & CR2 & CR3 ADDED.	DJK 2-27-68	
5	ECA 30336, CLASS E FIG. 2, TERM 23 WAS SHOWN CONNECTED TO T4 TERM 1 IN ERROR. TERM 24 WIRING CLARIFIED.	2-27-68 SB	
6	ECA 33295, CLASS B IN FIG. 1, 101, & REPLACEMENT ORDERING INFORMATION, CR2 & CR3 ADDED.	3-3-69 SB	DJK

△	REFERS TO DWG ISSUE NUMBER AND CHANGE IN DESCRIPTION COLUMN
( )	DENOTES REFERENCE INFORMATION NOT MARKED ON EQUIPMENT
	SHADED AREA DENOTES CIRCUITRY NOT RECOMMENDED FOR FIELD SERVICE
	PAIRED SHIELDED WIRE
□	NUMBER IN SQUARE REFERS TO RESPECTIVE NOTE
SYM	DESCRIPTION
	LEGEND

DESIGNED	APPLICATION	APPLICATION	APPROVED
GG	JAK	CH	RHF
ENGINEERING DATE	DWG BY	DRAFTING CHK	DRAFTING APPR
1-14-62	JMS	GLS	GRT

LENKURT ELECTRIC

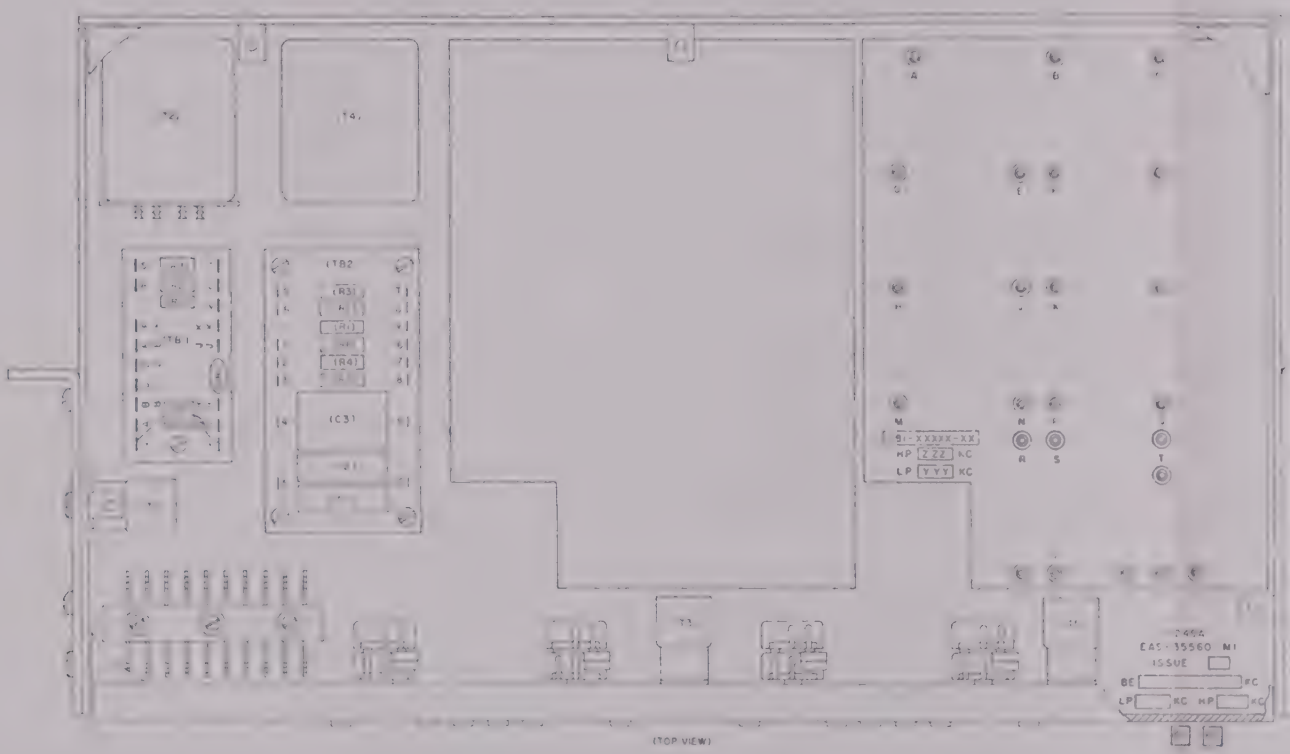
5249A MODEL 1
SPEECH PLUS DATA PANEL

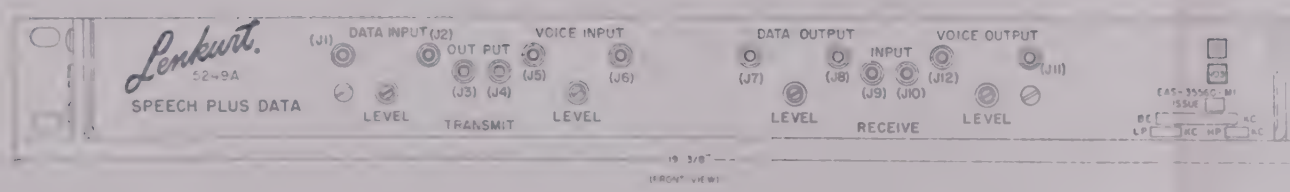
DWG ISSUE 6 | SHEET 1 OF 2 | SHEET

EAS-35560-M1 01

FIG. 101 [103] [102]

5249A
SPEECH PLUS DATA PANEL





NOTES

101 ISSUE NUMBER
ISSUE NUMBER MARKED ON EQUIPMENT AGREES WITH EAS DRAWING ISSUE NUMBER AT TIME OF MANUFACTURE

102 WARRANTY MARKING
THE WARRANTY MARKING WILL NORMALLY APPEAR IN THE BOTTOM RIGHT SIDE OF THE PANEL. E.G., (WARRANTY 1167) REFERS TO THE START OF WARRANTY PERIOD NOVEMBER, 1967

103 FREQUENCY OF FILTERS
FREQUENCY OF HP AND LP OF FILTERS WILL BE SUBSTITUTED FOR YYY AND ZZZ RESPECTIVELY

REPLACEMENT ORDERING INFORMATION

EAS-35560-MI

DIST. CODE L-M9 | SHEET 2 OF 2

OPTIONAL CODES					REPLACEABLE ASSEMBLIES AND COMPONENTS				
E	D	C	B	A	ITEM	DESIG	DESCRIPTION WHEN ORDERING COMPONENTS, SPECIFY UNIT TYPE NUMBER, COMPONENT DESIGNATION, AND COMPONENT STOCK NO.	COMPONENT STOCK NUMBER	QTY
					1		TRANSMIT ASSEMBLY		
							COMPONENTS AND ASSEMBLY		
						R1,R2	RES., 422 OHM 1/2W 1%	161-04223-02	2
						R3	RES., 196 OHM 1/2W 1%	161-01963-02	1
						CR1	DIODE	176-38547-01	2
						J1,J3,J4,J6	JACK, PIN (RED)	139-28969-01	4
						J2,J5	JACK, PIN (BLACK)	139-28969-02	2
						CR2, CR3	DIODE	174-37699-01	2
						A1,A2	DELTA T PAD ASSEMBLY	087-10072-01	2
							COMPONENTS:		
						R1	POTENTIOMETER, DUAL	178-10020-01	1
						R2,R3	RES., 620 OHM 1/2W SPC	160-06203-42	2
						T1,T3	TRANSFORMER, A440J	080-00440-10	2
						T2	TRANSFORMER	080-04035-03	1
						TB1	TRANSMIT SUBPANEL	087-37676-01	1
				1	2		RECEIVE ASSEMBLY		
							COMPONENTS AND ASSEMBLY		
						R1,R2	RES., 422 OHM 1/2W 1%	161-04223-02	2
						R3	RES., 196 OHM 1/2W 1%	161-01963-02	1
						R4	RES., 237 OHM 1/2W 1%	161-02373-02	1
						R5	RES., 604 OHM 1/2W 1%	161-06043-02	1
						R6	RES., 1470 OHM 1/2W 1%	161-01474-02	1
						C1,C2	CAP., 1.0μf MYLAR	056-11100-45	2
						C3	CAP., 4.7μf MYLAR	056-41470-46	1
						J7,J9, J10,J11	JACK, PIN (RED)	139-28969-01	4
						J8,J12	JACK, PIN (BLACK)	139-28969-02	2
						TB2	RECEIVE SUBPANEL	087-37677-01	1
						A3,A4	DELTA T PAD ASSEMBLY	087-10072-01	2
							COMPONENTS:		
						R1	POTENTIOMETER, DUAL	178-10020-01	1
						R2,R3	RES., 620 OHM 1/2W SPC	160-06203-42	2
						T4	TRANSFORMER, A463C	080-00463-03	1
						T5	TRANSFORMER, A440J	080-00440-01	1
						CR2,CR3	DIODE	174-37699-01	2
				1	3	FL1	FILTER	081-07967-00	1
			1		4	FL1	FILTER	081-07966-00	1
		1			5	FL1	FILTER	081-07965-00	1
1					6	FL1	FILTER	081-07968-00	1

DEV ENGR	APPL ENGR	APPL CKD	APPL APPD
GG	JAK	CH	RHF
DWG REL DATE	DWG BY	DFTG CHD	STD ENGR APPD
11-14-62	JMS	GLS	GRT

LENKURT ELECTRIC

5249A MODEL 1
SPEECH PLUS DATA PANEL

DWG ISSUE 6	SHEET 2 OF 2	SHEET
EAS-35560-MI		02

ORDERING INFORMATION

Various optional arrangements of equipment are available to meet specific application requirements. Available arrangements are indicated by option codes as listed below. Only the basic panel with appropriate filters is required for 2-wire vf drop to 2-wire line or one-way operation. An additional assembly (Code A installed in the same panel) is required for 4-wire line applications. The code must be specified in all equipment orders.

5249A	Basic equipment for 2-wire vf drop to 2-wire line or one-way applications.
Code A	An additional receive assembly in the basic panel for either 4-wire or 2-wire vf drop to 4-wire line applications.

The type and frequency of the filter are indicated by an additional code (B, C, D, or E), which must be shown for both the basic panel and Code A assembly.

Code B	2.75 kc HP and 2.4 kc LP
Code C	2.4 kc HP and 2.08 kc LP
Code D	2.04 kc HP and 1.7 kc LP
Code E	1.65 kc to 2.26 kc BE with a coupling pad (for use when speech channel is equipped with 2600 cps in-band signaling).

EXAMPLES: 5249A-C indicates a panel for 2-wire vf drop to 2-wire line with a 2.4-kc HP and 2.08-kc LP filter combination.

5249A-E-AE indicates a panel for 2-wire or 4-wire vf drop to 4-wire line application with a 1.65-kc to 2.26-kc BE filter and coupling pad combination in both the basic and Code A sections.

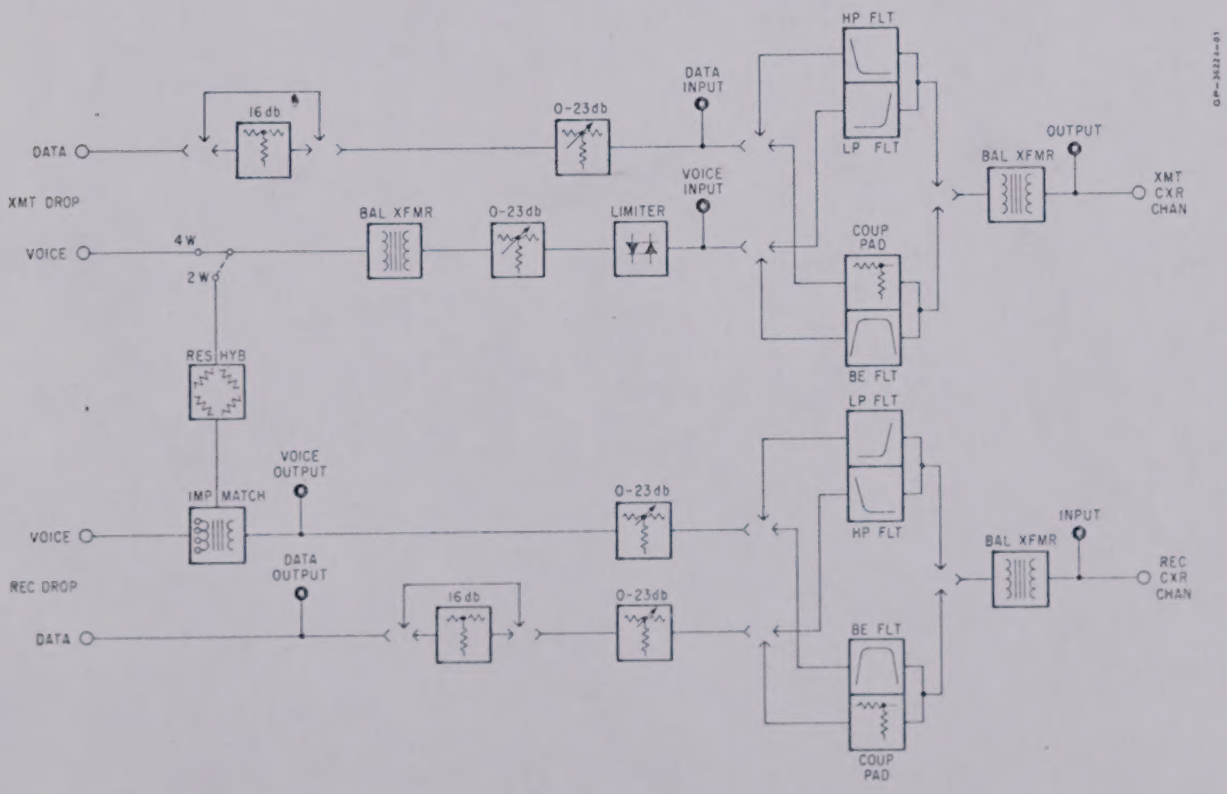


Figure 5. Simplified block diagram of Speech Plus Data Panel.

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